

In the Claims:

Please cancel claims 7 and 30, without prejudice, and amend claims 1 and 27 as follows:

1. (Currently Amended) A storage apparatus having a plurality of round storage areas, on each of which a plurality of servo frames are arranged at uniform intervals in a spoke-like pattern, said apparatus comprising:

an index bit storing section provided to each said servo frame arranged in each individual one of said plurality of storage areas, said index bit storing section storing, as an index bit, part of an index pattern having a specific bit pattern, which index pattern is operable to identify the individual storage area;

an index bit obtaining unit for obtaining such index bits, each of which is stored in the index bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a storage area recognizing unit for recognizing the individual storage area based on the index bits, which are obtained by said index bit obtaining unit,

a sector bit storing section provided to each said servo frame arranged in each said storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern which is operable to identify a position of such index pattern in the individual storage area, in association with the corresponding index bit storing section;

a sector bit obtaining unit for obtaining such sector bit from the sector bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a position recognizing unit for recognizing a position of each said servo frame in the individual storage area based on such sector bits obtained by said sector bit obtaining unit,

wherein the index bits, each of which is stored in the index bit storing section of each said servo frame arranged in the individual storage area, being adapted to form, when being sequentially arranged, an index bit string which includes a plurality of index patterns each having the specific bit pattern-pattern, and

wherein said position recognizing unit (i) recognizes a position of the sector bits, constituting the sector pattern, in the storage area based on such sector bits obtained by said sector bit obtaining unit, (ii) recognizes a position of the index pattern corresponding to the sector pattern based on the recognized position of the sector bits, and (iii) recognizes the position of each said servo frame in the individual storage area based on the recognized position of the index pattern.

2. (Original) A storage apparatus as set forth in claim 1, wherein each of said plurality of storage areas is associated with such index pattern that is unique to each said storage area.

3. (Original) A storage apparatus as set forth in claim 2, wherein hamming distance between any two of the index patterns, which index patterns are associated one with each of said storage areas, is a predetermined value or greater.

4. (Original) A storage apparatus as set forth in claim 1 further comprising:
a provisional index pattern obtaining unit for obtaining a provisional index pattern based on the index bits obtained by said index bit obtaining unit;

a first hamming distance calculator for calculating hamming distances between the provisional index pattern, which is obtained by said provisional index pattern obtaining unit, and the index patterns; and

an index pattern verifying unit for verifying that the provisional index pattern is such index pattern, based on the hamming distances, which are calculated by said first hamming distance calculator,

said storage area recognizing unit recognizing the individual storage area based on the index pattern which is verified by said index pattern verifying unit.

5. (Original) A storage apparatus as set forth in claim 2 further comprising:
a provisional index pattern obtaining unit for obtaining a provisional index pattern based on the index bits obtained by said index bit obtaining unit;

a first hamming distance calculator for calculating hamming distances between the provisional index pattern, which is obtained by said provisional index pattern obtaining unit, and the index patterns; and

an index pattern verifying unit for verifying that the provisional index pattern is such index pattern, based on the hamming distances, which are calculated by said first hamming distance calculator,

said storage area recognizing unit recognizing the individual storage area based on the index pattern which is verified by said index pattern verifying unit.

6. (Original) A storage apparatus as set forth in claim 3 further comprising:

a provisional index pattern obtaining unit for obtaining a provisional index pattern based on the index bits obtained by said index bit obtaining unit;

a first hamming distance calculator for calculating hamming distances between the provisional index pattern, which is obtained by said provisional index pattern obtaining unit, and the index patterns; and

an index pattern verifying unit for verifying that the provisional index pattern is such index pattern, based on the hamming distances, which are calculated by said first hamming distance calculator,

said storage area recognizing unit recognizing the individual storage area based on the index pattern which is verified by said index pattern verifying unit.

7. (Cancelled)

8. (Original) A storage apparatus as set forth in claim 2, further comprising:

a sector bit storing section provided to each said servo frame arranged in each said storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section;

a sector bit obtaining unit for obtaining such sector bit from the sector bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a position recognizing unit for recognizing a position of each said servo frame in the individual storage area based on such sector bits obtained by said sector bit obtaining unit.

9. (Original) A storage apparatus as set forth in claim 3, further comprising:

a sector bit storing section provided to each said servo frame arranged in each said storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section;

a sector bit obtaining unit for obtaining such sector bit from the sector bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a position recognizing unit for recognizing a position of each said servo frame in the individual storage area based on such sector bits obtained by said sector bit obtaining unit.

10. (Original) A storage apparatus as set forth in claim 4, further comprising:

a sector bit storing section provided to each said servo frame arranged in each said storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section;

a sector bit obtaining unit for obtaining such sector bit from the sector bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a position recognizing unit for recognizing a position of each said servo frame in the individual storage area based on such sector bits obtained by said sector bit obtaining unit.

11. (Original) A storage apparatus as set forth in claim 5, further comprising:

a sector bit storing section provided to each said servo frame arranged in each said storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section;

a sector bit obtaining unit for obtaining such sector bit from the sector bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a position recognizing unit for recognizing a position of each said servo frame in the individual storage area based on such sector bits obtained by said sector bit obtaining unit.

12. (Original) A storage apparatus as set forth in claim 6, further comprising:

a sector bit storing section provided to each said servo frame arranged in each said storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section;

a sector bit obtaining unit for obtaining such sector bit from the sector bit storing section of each said servo frame arranged in the individual storage area, one after another; and

a position recognizing unit for recognizing a position of each said servo frame in the individual storage area based on such sector bits obtained by said sector bit obtaining unit.

13. (Original) A storage apparatus as set forth in claim 7, wherein, in each said storage area, each of said plurality of index patterns is associated with a unique sector pattern that is unique to each said index pattern.

14. (Original) A storage apparatus as set forth in claim 10, wherein, in each said storage area, each of said plurality of index patterns is associated with a unique sector pattern that is unique to each said index pattern.

15. (Original) A storage apparatus as set forth in claim 13, wherein hamming distance between any two of the unique sector patterns, which are associated one with each of said index patterns, is a predetermined value or greater.

16. (Original) A storage apparatus as set forth in claim 14, wherein hamming distance between any two of the unique sector patterns, which are associated one with each of said index patterns, is a predetermined value or greater.

17. (Original) A storage apparatus as set forth in claim 4, further comprising:
a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

18. (Original) A storage apparatus as set forth in claim 5, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

19. (Original) A storage apparatus as set forth in claim 6, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

20. (Original) A storage apparatus as set forth in claim 7, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the

individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

21. (Original) A storage apparatus as set forth in claim 8, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

22. (Original) A storage apparatus as set forth in claim 10, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

23. (Original) A storage apparatus as set forth in claim 13, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

24. (Original) A storage apparatus as set forth in claim 14, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

25. (Original) A storage apparatus as set forth in claim 15, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

26. (Original) A storage apparatus as set forth in claim 16, further comprising:

a provisional sector pattern obtaining unit for obtaining a provisional sector pattern based on the sector bits obtained by said sector bit obtaining unit;

a second hamming distance calculator for calculating hamming distance between the provisional sector pattern, which is obtained by said provisional sector pattern obtaining unit, and the sector pattern; and

a sector pattern verifying unit for verifying that the provisional sector pattern is such sector pattern, based on the hamming distance, which is calculated by said first hamming distance calculator,

said position recognizing unit recognizing, based on the sector pattern that is verified by said sector pattern verifying unit, a position of each said servo frame in the individual storage area, each said servo frame having such sector bit storing section each storing individual sector bit that is part of the provisional sector pattern.

27. (Currently Amended) A storage medium having a plurality of round storage areas, on each of which a plurality of servo frames are arranged at uniform intervals in a spoke-like pattern, said medium ~~comprising~~comprising:

an index bit storing section provided to each said servo frame arranged in each individual one of said plurality of storage areas, said index bit storing section storing, as an index bit, part of an index pattern having a specific bit pattern, which index pattern is operable to identify the individual storage ~~area, area, and~~

a sector bit storing section provided to each said servo frame arranged in each individual one of said plurality of storage areas, said sector bit storing section storing, as a

sector bit, part of a sector pattern, operable to identify a position of such index pattern in the individual storage area, in association with the corresponding index bit storing section,

wherein the index bits, each of which is stored in the index bit storing section of each said servo frame arranged in the individual storage area, being adapted to form, when being sequentially arranged, an index bit string which includes a plurality of index patterns each having the specific bit pattern,

wherein the sector bits, each of which is stored in the sector bit storing section of each said servo frame arranged in the individual storage area, being adapted to form, when being sequentially arranged, a sector bit string that includes the sector pattern, and

wherein the sector bits constituting the sector pattern are arranged so as to correspond to the index bits constituting the index pattern.

28. (Original) A storage medium as set forth in claim 27, wherein each of said plurality of storage areas is associated with such index pattern that is unique to each said storage area.

29. (Original) A storage medium as set forth in claim 28, wherein hamming distance between any two of the index patterns, which index patterns are associated one with each of said storage areas, is a predetermined value or greater.

30. (Cancelled)

31. (Original) A storage medium as set forth in claim 28, further comprising a sector bit storing section provided to each said servo frame arranged in each individual one of said plurality of storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern, which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section,

the sector bits, each of which is stored in the sector bit storing section of each said servo frame arranged in the individual storage area, being adapted to form, when being sequentially arranged, a sector bit string that includes the sector pattern.

32. (Original) A storage medium as set forth in claim 29, further comprising a sector bit storing section provided to each said servo frame arranged in each individual one of said plurality of storage areas, said sector bit storing section storing, as a sector bit, part of a sector pattern, which is operable to identify a position of such index pattern in the individual storage area, in association with corresponding index bit storing section,

the sector bits, each of which is stored in the sector bit storing section of each said servo frame arranged in the individual storage area, being adapted to form, when being sequentially arranged, a sector bit string that includes the sector pattern.

33. (Original) A storage medium as set forth in claim 30, wherein, in each said storage area, each of said plurality of index patterns is associated with a unique sector pattern that is unique to each said index pattern.

34. (Original) A storage medium as set forth in claim 31, wherein, in each said storage area, each of said plurality of index patterns is associated with a unique sector pattern that is unique to each said index pattern.

35. (Original) A storage medium as set forth in claim 32, wherein, in each said storage area, each of said plurality of index patterns is associated with a unique sector pattern that is unique to each said index pattern.

36. (Original) A storage medium as set forth in claim 33, wherein hamming distance between any two of the unique sector patterns, which are associated one with each of said index patterns, is a predetermined value or greater.

37. (Original) A storage medium as set forth in claim 34, wherein hamming distance between any two of the unique sector patterns, which are associated one with each of said index patterns, is a predetermined value or greater.

38. (Original) A storage medium as set forth in claim 35, wherein hamming distance between any two of the unique sector patterns, which are associated one with each of said index patterns, is a predetermined value or greater.